

WHAT IS CLAIMED

1. A method for modulating a signal for transmission, comprising:
receiving a source signal;
splitting the source signal into a first split signal and second split signal;
5 modulating the first split signal based on a first dataset to generate a first
modulated signal;
shifting a phase of the second split signal to generate a phase-shifted second
split signal;
modulating the phase-shifted second split signal based on a second dataset to
10 generate a modulated second signal;
controlling the polarization of the modulated second signal; and
combining the modulated first signal and the modulated second signal to
generate a combined signal.
- 15 2. The method of Claim 1, wherein the polarization of the second signal
is controlled to be orthogonal to the polarization of the modulated first signal.
3. The method of Claim 1, wherein the phase-shift is ninety degrees.
- 20 4. The method of Claim 1, wherein immediately prior to combination, the
polarization of the modulated first signal is transverse electric (TE) polarization, and
the polarization of the polarized second signal is transverse magnetic (TM)
polarization.
- 25 5. The method of Claim 1, wherein the modulation is by phase
modulation.
6. The method of Claim 1, further comprising modulating the source
signal.
- 30 7. The method of Claim 6, wherein the source signal is modulated by
intensity modulation.

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8. The method of Claim 7, wherein the intensity modulation is periodic.

9. The method of Claim 7, wherein the intensity modulation is by a clock
5 signal whose frequency and phase are synchronized with a data signal.

10. The method of Claim 1, wherein the signal is optical.

11. The method of Claim 1, further comprising modulating the combined
10 signal.

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12. A method for receiving a signal, comprising:
generating a polarized signal based on receiver-side feedback;
combining an ingress traffic signal with the polarized signal to
generate a combined signal;
5 splitting the combined signal into a first split signal and second split
signal;
detecting the first split signal; and
detecting the second split signal.

10 13. The method of Claim 12, wherein the ingress traffic signal is
compensated for polarization mode dispersion.

14. The method of Claim 12, wherein the polarization is circular.

15 15. The method of Claim 12, wherein the first split signal comprises a first
component of the received signal.

16. The method of Claim 12, wherein the second split signal comprises a
second component of the received signal.

20 17. The method of Claim 12, wherein the ingress traffic signal is optical.

18. The method of Claim 12, wherein the combined signal is split by a
polarization beam splitter (PBS).

25 19. The method of Claim 18, wherein the polarization of a first component
of the ingress traffic signal is aligned to an axis of the polarization beam splitter.

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20. A system for transmitting a signal, comprising:
a means for providing a source signal;
a means for splitting the source signal into a first split signal and second split
signal;

5 a means for modulating the first split signal based on a first dataset to generate
a modulated first split signal;

a means for shifting a phase of the second split signal to generate a phase-
shifted second split signal;

10 a means for modulating the phase-shifted second split signal based on a
second dataset to generate a modulated second signal;

a means for controlling the polarization of the modulated second signal to
generate a polarized signal; and

a means for combining the modulated first split signal and the polarized signal
to generate a combined signal.

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21. The system of Claim 20, wherein the polarization of the modulated
second signal is orthogonal to the polarization of the modulated first signal.

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22. The system of Claim 20, wherein the phase shift is ninety degrees;

23. The system of Claim 20, wherein immediately prior to combination,
the polarization of the modulated first signal is transverse electric (TE) polarization,
and the polarization of the polarized second signal is transverse magnetic (TM)
polarization.

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24. The system of Claim 20, wherein the modulation is by phase
modulation.

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25. The system of Claim 20, further comprising a means for modulating
the source signal.

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26. The system of Claim 25, wherein the source signal is modulated by intensity modulation.

27. The system of Claim 26, wherein the intensity modulation is periodic.

28. The system of Claim 26, wherein the intensity modulation is by a clock signal whose frequency and phase are synchronized with a data signal.

29. The system of Claim 28, wherein the clock signal is at a symbol rate.

30. The system of Claim 20, wherein the signal is optical.

31. The system of Claim 20, wherein the source signal means is a continuous wave laser.

32. The system of Claim 20, wherein the source signal is split by a polarization beam splitter; and
wherein the source signal is circularly polarized.

33. The system of Claim 20, wherein the source signal is split by a half mirror.

34. The system of Claim 20, wherein the source signal is split by a three decibel splitter.

35. The system of Claim 20, wherein the phase shift means is by applying direct current (DC) voltage to the modulator.

36. The system of Claim 20, wherein the means for controlling polarization is a half-wave plate.

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37. A system for receiving a signal comprising:
a means for receiving a signal;
a means for providing a local signal;
a means for controlling a polarization of the local signal to generate an
5 appropriately polarized local signal;
a means for combining the polarized local signal and received signal;
a means for splitting the combined signal into a first split signal and a
second split signal;
a means for detecting the first split signal;
10 a means for detecting the second split signal; and
a means for generating feedback to modify the local signal.
38. The system of Claim 37, wherein the received signal is compensated
for polarization mode dispersion.
- 15 39. The system of Claim 37, wherein the signal is received by an
automatic polarization controller.
40. The system of Claim 37, wherein the appropriate polarization of the
20 local signal is circular.
41. The system of Claim 37, wherein the first split signal comprises a first
component of the received signal.
- 25 42. The system of Claim 37, wherein the second split signal comprises an
orthogonally polarized second component of the received signal.
43. The system of Claim 37, wherein the signal is optical.
- 30 44. The system of Claim 37, wherein the local signal is provided by a
continuous wave laser.

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45. The system of Claim 37, wherein the local signal means yields circularly polarized light.

46. The system of Claim 37, wherein the means to control polarization is a
5 quarter wave plate.

47. The system of Claim 37, wherein the combiner means is a 3 decibel
splitter.

10 48. The system of Claim 37, wherein the combiner means is a half mirror.

49. The method of Claim 37, wherein the splitting means is a polarization
beam splitter; and

a first component of the signal is aligned to an axis of the polarization beam
15 splitter.

50. The system of Claim 37, wherein the detecting means is a photodiode.

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51. An optical transmitter, comprising:
- a carrier signal generator, operable to generate an optical signal;
 - an intensity modulator, optically coupled to the carrier signal generator and operable to modulate an intensity of the optical signal to generate an intensity modulated signal;
 - a first beam splitter, optically coupled to the intensity modulator and operable to receive and divide the intensity modulated signal into two separate signals;
 - a first phase modulator, optically coupled to the first beam splitter and operable to receive a data stream and modulate a phase of an optical signal based on the data stream to generate a first modulated signal;
 - a phase shifter, optically coupled to the first beam splitter and operable to shift a phase of an optical signal;
 - a second phase modulator, optically coupled to the phase shifter and operable to receive a data stream and modulate a phase of an optical signal based on the data stream to generate a second modulated signal;
 - a half wave plate, optically coupled to the second phase modulator and operable to receive the second modulated signal and generate a signal with a polarization state that is orthogonal to the polarization state of the first modulated signal to generate an orthogonal signal;
 - a second polarization beam splitter, optically coupled to the first phase modulator and the half wave plate and operable to combine the first modulated signal with the orthogonal signal to generate a combined signal.

52. An optical receiver, comprising:

a local oscillator optically coupled to a quarter wave plate and operable to generate an optical signal;

the quarter wave plate optically coupled to a first beam splitter and
5 operable to receive an optical signal, circularly polarize the optical signal to generate a circularly polarized signal, and transmit the polarized signal to the first beam splitter;

the first beam splitter optically coupled to a second polarization beam splitter and operable to receive an optical traffic signal, combine the optical traffic
10 signal with the circularly polarized signal to generate a combined signal, and transmit the combined signal to the second polarization beam splitter;

the second polarization beam splitter optically coupled to a first photodiode and a second photodiode and operable to receive the combined signal, split the combined signal into a first split signal and a second split signal, and transmit
15 the first split signal to the first photodiode and the second split signal to the second photodiode;

the first photodiode coupled to a decision circuit and operable to receive the first split signal, generate a first data signal based on the first split signal, and transmit the first data signal to the decision circuit;

20 the second photodiode coupled to a decision circuit and operable to receive the second split signal, generate a second data signal based on the second split signal, and transmit the second data signal to the decision circuit;

the decision circuit coupled to a feedback control module and operable to determine a desired optical signal generated by the local oscillator generate a
25 control signal based on the desired optical signal, and transmit the control signal to the feedback control module;

the feedback control module coupled to the local oscillator and operable to generate an oscillator control signal based on the control signal; and

30 the local oscillator operable to receive the oscillator control signal and modify the optical signal based on the oscillator control signal.

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53. A method for generating a signal for transmission, comprising:
combining a first signal having a first polarization state with a second
signal having a second polarization state orthogonal to the first polarization state to
generate a QPSK signal; and
5 intensity modulating a signal associated with the QPSK signal, the
signal comprising one of a carrier signal and the QPSK signal.

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54. A method for processing a signal, comprising:
receiving an intensity modulated QPSK signal comprising orthogonal
components; and

5 decoding the QPSK signal.

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